NATURAL HISTORY MISCELLANEA

Published by

The Chicago Academy of Sciences

Lincoln Park-2001 N. Clark St. Chicago, Illinois 60614 U.S.A.

No. 199 **December 29, 1977**

A new *Mooreoceras* (Orthocerida: Pseudorthoceratidae) from the Mattoon Formation of Illinois

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Specimens of a previously undescribed *Mooreoceras* are not uncommon in the Shumway Limestone Member (Mattoon Formation, Pennsylvanian) at S E 1/4 S E 1/ S W 1/ , sec. 26, T.9N., R.5 E., Effingham quadrangle, Effingham **Co.,** Illinois. The present paper describes this species and the mature aperture of *Mooreoceras* for the first time. The Shumway Cyclothem which includes the Shumway Limestone Member was described by Kosanke *et al. (1960)* .

Systematic Paleontology

Family Pseudorthoceratidae Flower & Caster, 1935

Genus *Mooreoceras* Miller, Dunbar & Condra, 1933

Mooreoceras wanlessi, n. sp.

Material. The holotype (PE 27957) is an incomplete mature specimen measuring 68 mm long, 37 mm of which is living chamber. 13 paratypes were also studied (PE 28346-28358) . All types are deposited in the Field Museum of Natural History, Chicago.

Diagnosis. This slightly depressed species of *Mooreoceras* has pyriform connecting rings, long (4 or fewer in a length equal to the width of the shell) and only slightly convex ($^1/_1$ o-% the diameter of the septa) camerae, small conch with a total length of less than 250 mm and ex-

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pands at an adapical angle of 8 degrees except for the living chamber of mature individuals which expands at 6 degrees.

Description. The conch is a long slender gradually expanding, slightly depressed orthocone with an adapical angle of 8 degrees on the phragmacone. The living chamber of mature specimens expands at about 6 degrees. The longest mature paratype which is not complete at either end is 162 mm long. The conch is straight except for slight exogastric curvature at the adapical end. **The cross section of the conch varies at different stages of growth. Where the conch is 5.3 mm wide ,it is 5.2 mm high. But by the time the lateral diameter has reached 17 mm the height is 15** mm. **The conch is 23 mm wide and 21 mm high at the junction of the phragmacone and living chamber of the holotype and 27 mm and 25 mm in width and height, respectively, at the adoral end of the living chamber**

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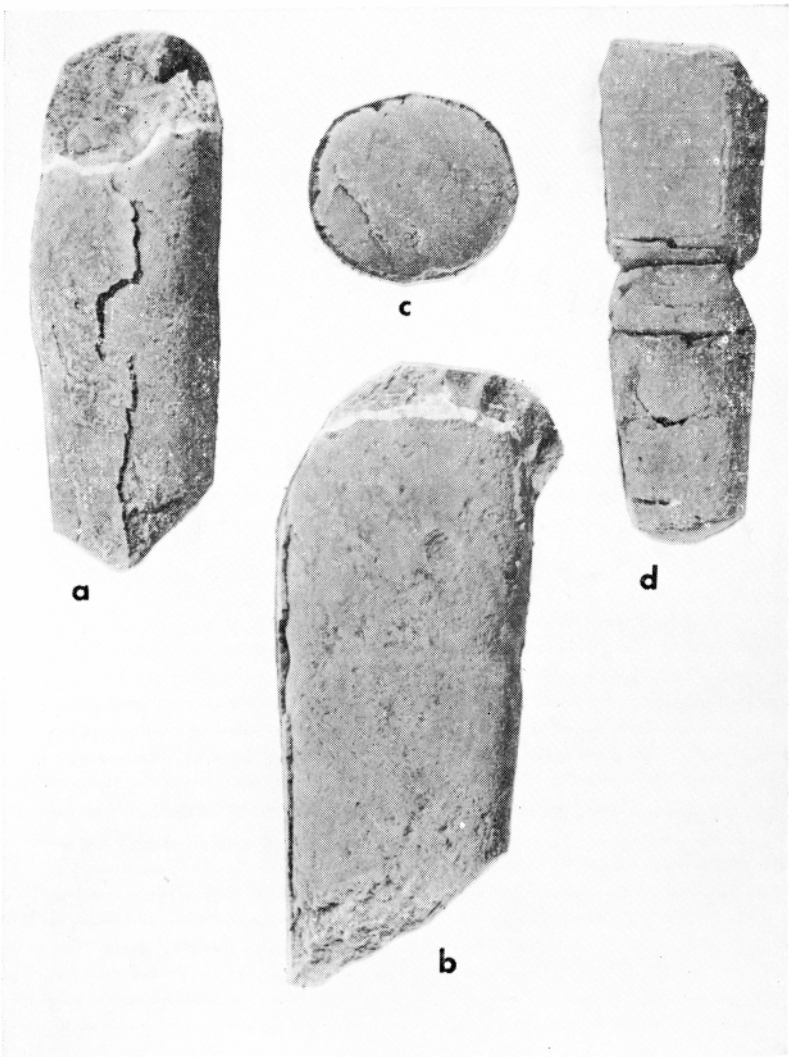

Plate I, Figure a. Lateral view of a paratype (PE 28346) of *Mooreoceras wanlessi,* n. sp., showing nature of the aperture (outlined in white). X 1.
Figure b. Dorsal view of a paratype (PE 28346) of *M. wanlessi,* n. sp., showing nature of the aperture and position of the internal constriction in relation to the aperture. X 1.4.
Figure c. Septal view of the holotype (PE 27957) of *M. wanlessi,* n. sp., ventral side toward the bottom of the plate. X 1.4.
Figure d. Ventral view of the holotype (PE 27957) of *M. wanlessi,* n. sp. X 1.

of another mature specimen. The septa are saucer shaped and only slightly convex. The convexity is about 0.64 times the length of the camerae or $_{1/10\text{-}1/8}$ the diameter of the septa where the shell is 17 mm wide. Due to shortening of the camerae at maturity, the convexity increases to 2.3 times the length of the camerae but remains $_{1/10\text{-}1/8}$ the diameter of the septa where the shell is 23 mm wide. The camerae are long with 4 or fewer in a space equal to the width of the shell at 17 mm conch width. The sutures are essentially circular with slight ventral and dorsal lobes formed by the adoral sutures of mature specimens. The siphuncle varies in position depending on growth stage. Until the conch is 6-8 mm wide the siphuncle is essentially central in position. Beyond that width the siphuncle becomes noticeably eccentric in position. The siphuncle of the holotype is 4.3 mm from the venter where the shell is 21.6 mm high. Internally, the septal necks are cyrtochoanitic. The connecting rings are flattened pyriform in shape and are expanded within the camerae. Episeptal cameral deposits are present in the adapical portion of the shell. These have a lamellar structure similar to other members of the Pseudorthoceratidae.

One paratype (PE 28346) is complete adorally and the aperture of a mature *Mooreoceras* may be characterized for the first time. The transverse constriction reported by Miller and Owen (1934) and Unklesbay (1962) is a thickening of the shell. Externally the test shows no signs of this constriction. On the internal mold the constriction is well developed ventrally and laterally and less pronounced dorsally. The test though thickened over the constriction thins rapidly orad of the constriction. The ventral margin of the aperture is slightly contracted and has only a very shallow hyponomic sinus. There are deep lateral sinuses. Dorsally the shell is not contracted and it protrudes farther forward than the ventral margin of the aperture. Growth lines are not present on any of the specimens so it is impossible to determine when the lateral sinuses are developed.

Comparisons. M. wanlessi is most similar to those species of *Mooreoceras* that have pyriform connecting rings. M. *uniconstrictum* Miller and Owen is very similar but differs in the nature of the connecting rings and the size of maturity which is about half that reached by M. *wanlessi. M. normale* Miller, Dunbar and Condra is also similar to *M. wanlessi.* The septa of *M. normale* are more convex being about $^{1}/_{4}$ the diameter of the septa versus $^{1}/10\text{-}^{1}/8$ found in *M. wanlessi. M. bakeri* Miller, Dunbar and Condra and *M. angusticameratum* Miller, Dunbar and Condra both have short camerae with 6 or more occurring in the space equal to the width of the whorl. *M. depressum* Youngquist has 4 camerae in the space of 10 mm while equal sized *M. wanlessi* have 2 in the space of 10 mm. The poorly known *M. giganteum* (Swallow) appears to be a very large species reaching 40 mm in diameter about twice the size of mature *M. wanlessi.*

Discussion. In mature *M. wanlessi* of around 250 mm only the adapical 70 mm possesses cameral deposits. The deposits in the adapical 25 mm fill the ventral half and in the adapical 15 mm nearly fill the dorsal half. Ventral depoits persist farther orad than dorsal deposits.

Siphuncular deposits are restricted to the adapical 35 mm or so. In *Pseudorthoceras knoxense* (McChesney) cameral deposits are very heavy both ventrally and dorsally at a width of 9 mm (Kummel, 1964, p. k243) . At this size mature *M. wanlessi* (n — 3) have no cameral deposits at all. While the differences in cameral deposits of *P. knoxense* and *M. wanlessi* may be due to differences in some unknown structures or in the lengths reached by *P. knoxense* specimens commonly considered (Gordon, 1964) , they may also be due to differences in swimming attitude. *Mooreoceras* in general and *M. wanlessi* in particular may not have maintained a horizontal attitude in life. If *Mooreoceras* maintained the shell at an angle to the substrate and stayed near the bottom, then the contracted ventral margin of the shell could function to keep sediments out of the mantle fold. The transverse shell thickening could represent ballast to further alter the angle of attack at maturity. It could also protect the gills from foreign objects as it is best developed ventrally and appears only at maturity. It could even have served to seal the intake area of the mantle cavity when the body was retracted during the propulsive phase of locomotion. If *Mooreceras* was not horizontally oriented, then it was probably a poor swimmer relative to *Pseudorthoceras*. This reduced swimming ability may be reflected in the stratigraphic and geographic ranges of the forms. *P. knoxense* ranges throughout the Pennsylvanian and into the Permian. It is widely distributed, being found throughout the United States (Gordon, 1964) . *Mooreoceras* on the other hand is more provincial with several species known from one or a few geographically and stratigraphically restricted areas. This is to be expected if *Mooreoceras* are less mobile than *P. knoxense* and thus more likely to form geographically isolated populations where speciation may then occur.

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